TECHNOLOGY STANDARDS FOR THE IMPROVEMENT OF TEACHING AND LEARNING IN COMMUNITY COLLEGE MUSIC PROGRAMS

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Providing standards for music technology use in community college music programs presents both challenges and opportunities for educators in American higher education. A need exists to assess the current use of technology at the community college level for the purpose of improving instruction. Although limited research has been done on the use of technology to support music education K-12 and in four-year universities, little research on the problem in the community college setting was found.

This research employed a Delphi study, a method for the systematic solicitation and collection of professional judgments on a particular subject, to examine existing criteria, “best practices”, and standards, in an effort to develop a set of standards specifically for the community college level. All aspects of a complete music program were considered including: curriculum, staffing, equipment, materials/software, facilities and workforce competencies.

The panel of experts, comprised of community college educators from throughout the nation, reached consensus on 50 of the 57 standards. Forty-one or 82%, were identified as minimal standards for the application of music technology in music education. Community college music educators, planning to successfully utilize music technology to improve teaching and learning should

implement the 41 standards determined as minimal by the Delphi panel. As the use of music technology grows in our community college programs, the standards used to define the success of these programs will expand and mature through further research.

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CHAPTER I

INTRODUCTION

The community college music educator in the twenty-first century is confronted with a bewildering array of decisions regarding the use of technology in the classroom. The issues of funding, integration and suitability are pivotal when assessing the need for music technology as it relates to instruction. Ever-shrinking budgets and a national movement toward accountability and outcomes assessment demand that community college music educators be knowledgeable in all aspects of music technology. It should be of rising concern to educators that many incoming freshmen music majors, reared in the “video age”, have already used music technology at a higher level than some of their professors. Music technology, new to higher education since the mid-1980’s, is being taught by an aging professoriate that continues to teach music as it was taught forty years ago.

Out of this situation emerges a need to assess the current use of technology at the community college for the purpose of improving instruction. Although limited research has been done on the use of technology to support music education K-12 and in four-year universities, little research on the problem in the community college setting can be found. The combination of a brief forty-year history of music education in community colleges and an even shorter fifteen-year history of music technology may, in part, explain the paucity of

research on the subject. It is important to the future of music education to identify standards and criteria that are recognized as “best practices” for the purpose of improving instruction (Spendolini, 1992).

The process of benchmarking “best practices” may help to establish a set of standards and criteria that seem to be lacking in community college music departments. Spendolini, (1992) in his volume “The Benchmarking Book” specifies that benchmarking when applied to higher education is a continuous process for evaluating product outcomes that are recognized as “best practices” for the purpose of organizational improvement. In the absence of specific standards for community colleges, research that adds to the body of knowledge on the subject would be of value to music educators nationally.

Spendolini’s phrase, “recognizing” best practices, may hold the key to the choice of methodology. The Delphi study, a method for the systematic solicitation and collection of professional judgments on a particular subject, may prove to be an effective means of determining standards, criteria and best practices currently missing from the literature. The Delphi method employs a three round process of information gathering from a panel of experts whose ultimate goal is to reach consensus on a subject (Murry & Hammonds, 1995). Given the question “What are the ‘best practices’ in the use of music technology in community colleges nationally?” a panel of experts may be able to identify these practices and use the resultant knowledge to establish standards and therefore improve instruction.

This study will attempt to achieve this important objective by investigating the use of technology in community college music programs.

The Problem

How can community college music educators formulate standards of technology use to improve teaching and learning?

Purpose

The purpose of the study was to develop standards for technology use in community college music programs.

Research Questions

What standards currently exist for technology use in music education? What are the current “best practices” for technology use for community college music programs?

Can current standards be combined with results of a Delphi study to create standards for technology use in community college music programs?

Significance of the Study

The use of technology in community college music departments is a recent development dating back to the mid-1980s. Although research on music technology in four-year institutions is growing, little investigation has been done

on the community college level. It is important to assess current use by community college educators and to determine standards that serve as benchmarks and “best practices” related to instruction. The proposed research will provide valuable information to faculty and administrators seeking to improve instruction. Results of the study may serve as a model for further research on music technology.

Definition of Terms

Music Technology

Employment of computer-based hardware and software, as it relates to composition, performance, analysis, and research, to improve the teaching and learning process.

Delphi Method

A method for the systematic solicitation and collection of professional judgments on a particular subject.

Benchmarking

Continuous systematic process for evaluation.

Delimitations and Limitations

This study will be confined to a survey of thirty-six community college music educators engaged in music technology for improvement of instruction.

Comprising a panel of “experts”, these individuals will identify standards for music technology through the Delphi method of qualitative research.

The small sample inherent in the methodology may decrease the generalization of findings. Adapting current national standards to fit community colleges could be subject to other interpretations.

Assumptions

The researcher assumes that the issue of technology in community college music departments will relate significantly to the professoriate nationally. Further, it is assumed that the results of the study will provide an accurate benchmark of best practices in the field of community college music instruction. It is further assumed that members of the panel will be honest in their response to questions posed in the instrument.

CHAPTER II

LITERATURE REVIEW

Introduction

A thorough review of the literature regarding technology in community college music programs seeks to provide the theoretical and practical foundations for the study. Music education at the community college level, the impact of technology and its role in the curriculum, and the implications for teaching and learning will be outlined. A general discussion of the concept of benchmarking as a means of improving educational quality will include specific examples of use in higher education. The areas of student competencies and national standards for technology use in the curriculum will be reviewed and quantified. Finally, a discussion of findings will serve to focus the study.

Community college music programs must be accountable to stakeholders for the ultimate success of their students. Accountability can be described as being responsible or liable. Stakeholders, including administrators, taxpayers, and funding agencies can expect music programs to produce results, if given proper financial support. In order to address the problem of accountability, music educators must constantly seek out innovative methods of instruction. Traditional music education methodologies are now being augmented with an ever-growing

integration of new technologies. The result will produce better-educated musicians, able to deal with the complexities of these new technologies.

To be accountable to any constituency, educators must have a set of standards to be measured against. Merriam-Webster (1997) describes standard as "something established for use as a rule or basis of comparison in measuring quantity, quality or value" (p.1145). In review of the literature, no standards for the use of technology in community college music programs are found. The need for such standards becomes pivotal as educators deal with the current issues of accountability and outcomes assessment. Music educators would benefit from the increased exposure to a set of standards benchmarking "best practices" nationally. Compliance with standards and competencies could then be shown to stakeholders as a measure of accountability.

Problematic to the study is the use of four terms: standard, benchmarking, best practices, and consensus. In brief form, they can be defined as follows:

Standard - something established as a rule or basis of comparison

Benchmarking – continuous, systematic process for evaluation

Best practices – criteria accepted as of highest quality within a discipline

Consensus – general agreement

In the review of current literature the four terms are used interchangeably and are actually speaking to the same basic idea. A conglomerate definition might read: general agreement on a rule that identifies quality criteria used in continuous evaluation for the improvement of instruction. For the purpose of the study, the

four terms, although closely related in concept, will be condensed into one, referred to as “standards”, to provide clarity and consistency.

The goal of the study is to establish a set of standards for the use of technology in community college music programs. The goal will be accomplished by identifying existing standards, benchmarks, and best practices and then conducting a Delphi study to reach consensus on a set of standards specific to community colleges.

Music Technology: A Historical Overview

Music has been an important part of education in western societies for many centuries. It’s origins, as a subject worthy of formal study, can be traced to ancient Greek culture with the founding of the Academy by Plato in ca. 387 B.C. In the Republic, Plato wrote the following:

> Musical training is a more potent instrument than any other, because rhythm and harmony find their way into . . . the soul, imparting grace, and making the soul of him who is rightly educated graceful. . . . He who has received this true education . . . becomes noble and good, he will justly blame and hate the bad . . . and when reason comes he will recognize and salute the friend with whom his education has made him long familiar.

In America, public school music did not materialize until 1838 with the acceptance of Lowell Mason’s teaching efforts in Boston (Brophy, 1994). However, music was a part of the junior college movement from its inception in 1902 with the founding of the Joliet Junior College in Joliet, Illinois under the auspices of the University of Chicago, and by 1930, a total of 160 junior colleges

offered music courses as part of their “non-academic” curriculum (Eells, 1931, p. 489).

The history of the relationship between music and science, the forerunner of modern music technology, can be traced back to Pythagoras who employed numerical symbolism to describe the length of a vibrating string and the consonances it produced. Jean-Philippe Rameau studied the theory of harmony by using the scientific method of the eighteenth century. Improvements in industrial processes gave us more reliable musical instruments. Edison’s phonograph, invented in the late nineteenth century, enabled us to store and retrieve audio signals from storage by electromechanical means. And in the last twenty years of the twentieth century, the microchip is having profound implications within the field of music.

Carl Lesche has defined three distinct phases by which technology has developed (Lesche, 54). The first is the instrumental phase, in which man produces the physical and mental energy to perform work. An example of this first phase is the development of the various instruments of the orchestra. The instrument is analogous to an implement used by an artisan or craftsman and the quality of the musical product is determined by the player’s skill and expertise.

The second can be called the power or mechanical phase, in which the physical energy is supplied by technical means. This phase could be characterized by the development of the sampler/synthesizer. The exact sounds of each of the orchestral instruments can be recorded, stored, and played back at

any pitch, volume or combination without the operator knowing how to play any of the instruments. This phase is embraced by proponents of technical innovation within the boundaries of established musical contexts (Lesche, 1971).

The third is the automatic phase, in which an effort is made to carry out the physical and mental work by technical means. In this phase the musician himself is replaced. Since the computer is “composing” and producing music without human intervention, it becomes no more than electronic serendipity. If the human factor is no longer a consideration in the product, then the ensuing music is merely for man, not of man.

We can divide modern music technology into three general categories: 1) Audio/video technology, 2) Communication technology, and 3) Computer technology (Van Regenmorter, 1998). A short description of each will serve to lay groundwork for a later discussion regarding standards and instructional implications.

Analog recording and playback in the form of records and cassettes has given way, over the last decade, to digital recording technology in the form of compact disc (CD) and digital audiotape (DAT) recorders. Improvement in video technology such as high definition television (HDTV), digital cameras, and digital video recorders and players has been impressive. The merging of the two fields in the form of CD-ROM, laser disc, and digital versatile disc (DVD) have important instructional implications for the improvement of teaching and learning.

Communication technology; the development of cable networks, satellite

technology, technology, computer networks, E-mail, and the Internet will have far-reaching effects on music education. The ability to communicate without the boundaries of physical location will impact both music marketing and music distribution. The concept of virtual recording studios; allowing musicians to play their parts anywhere in the world, then send them electronically for final editing, will change the face of traditional recording technology. Music educators wishing to do research can now access worldwide music databases, preview scores and listen to audio excerpts of scores without leaving their offices.

Computer technology, with its capability of processing, storing and retrieving large amounts of information, has proven to be a most useful tool for musicians. With the introduction of Musical Instrument Digital Interface (MIDI) in 1983, sounds can now be converted directly into digital information for processing and storage. The computers non-linear environment allows for excellent sound editing capabilities. The computer has become the cornerstone of the multimedia experience.

The Role of Technology in the Music Curriculum

The use of technology is pervasive in modern society. From digital wristwatches and cellular telephones, to FAX machines and E-mail, technology is being used everywhere (www.ti-me). Students are growing up in an environment where technology will be a part of their everyday lives and teachers must prepare them for the future. Music teachers have always employed technology in the

curriculum in the form of music playback, videos, electronic pianos and overhead projectors. Today's new technology tools can assist teachers in becoming even more effective.

Advocates of technology-assisted learning base their rationale on two premises: 1) technology is a tool that can extend the mind's capacity to think and learn and 2) technology is a tool that can build new working and learning relationships among people through new means of communications (Reese, 1994). The thought that technology can expand our capacity for learning is based on a theory of learning known as constructivism. The foremost advocate of the theory, Jean Piaget (1959), believed that knowledge couldn't be directly transmitted from one person to the next, but that each person must actively construct his own understanding based on what he already knows. Constructivism emphasizes the importance in learning of personal discovery, curiosity, intrinsic motivation and problem solving. Constructivism differs from the behaviorist views of learning and teaching for most of the 20th century (Reese, 1994). Behaviorists like B.F. Skinner and E.L. Thorndike believed that the mind is a passive entity shaped by external environmental forces.

Early attempts at integrating technology into college music curriculums in the 1960's and 1970's centered on the use of software that was consistent with the behaviorist approach to learning. Computer Aided Instruction (CAI), in its earliest form, employed software that allowed students to practice and memorize

musical facts. While drill and practice software had a place in learning it was often criticized as “drill and kill” or “thousand dollar flashcards” (Wilman, 1992).

More recently a different approach to music software design has emerged that is aligned with constructivist views of learning. The design promotes a higher order of creative thinking and personal discovery. Often called interactive media or hypermedia, the software emphasizes exploration and discovery rather than specific skill development or acquisition of information. The philosophical approach to individual exploration and discovery is consistent with the premise of active learning, where the learner is intellectually engaged in the process. Wilman states that the student must be capable of making music decisions and exercising musical judgment that will enable him to respond to music with understanding.

Given the aforementioned philosophical parameters, it is the responsibility of college music educators to integrate technology into the curriculum to enhance the learning process. Technology instruction in music programs is a “bottom up” process: that is, as students develop greater skill and knowledge in technology, they put increasing pressure on faculty to incorporate technology into their instruction. This process becomes a more effective strategy for the integration of technology throughout the entire music curriculum than any mandate that “trickles down” from the top (Deal & Taylor, 1997).

Definition of Benchmarking

The definition of benchmarking, for the purposes of the study, is a synthesis of numerous approaches including a general dictionary version, a corporate definition, and a specific application to higher education. Meriam-Webster (1997) defines benchmarking as: “something that serves as a standard by which others may be measured or judged”. The corporate version (Camp 1989) states that benchmarking is the continuous process of measuring products, services and practices against the toughest competitors or those companies recognized as industry leaders. According to Spendolini (1992) in his book about the application of benchmarking to higher education; benchmarking is a continuous, systematic process for evaluating the product, service or work processes of organizations that are recognized as presenting best practices for the purpose of organizational improvement. Strasler (1995) further compares the term benchmarking with standard, criterion, yardstick, hallmark or touchstone. He succinctly states: “benchmarking is a point of reference to which practices can be compared and valued” (p.14). Kempner (1993) aptly sums up the various definitions when he asks, as a framework for a successful benchmarking study, the following questions:

- How well are we doing?
- How good do we want to be?
- Who is doing it best?
- How do they do it?

- How can we adapt it to our situation?
- How can we do it better?

Historical Background

In the 1880's the Singer sewing machine company became known for its unusual new manufacturing process: mass production. People traveled for many miles to upstate New York to inspect the novel way that Singer produced low-cost sewing machines. A few of the visitors later introduced similar production techniques in their own companies (Strasler, 1995). From these humble beginnings the concept of benchmarking has grown to have universal use as a tool for continuous improvement in both the corporate and educational worlds.

The Xerox Corporation is credited by most to be the first to utilize the concept of benchmarking. Faced with increasing competition from the Japanese, who were able to produce and sell copiers at a far reduced rate, the Xerox Company in 1979 needed to improve their processes to remain competitive. With an ultimate goal to improve these processes while reducing costs, Xerox utilized benchmarking to "search for industry best practices that lead to superior performance" (Camp, 1989). The use of benchmarking as an improvement process was developed and implemented, and Xerox returned to prominence in the copier industry.

Benchmarking in Higher Education

Although the process of benchmarking in higher education is a recent development over the past decade, it is no less an effective tool for academe than corporate America. Colleges and universities may find instructive some of the lessons learned from industry transformations over the past two decades (Epper, 1999). Epper further states that focusing internally on process improvement is the first step in achieving greater competitive advantage. “In many ways, and perhaps without realizing it, colleges and universities have always engaged in benchmarking” (Epper, 1999). Higher education is a natural for benchmarking, with institutions remarkably open and comfortable sharing information. What is education itself – our core mission – but continuous improvement through learning? Surely we want to endorse that idea as a description not only of our educational goal, but also of our organization as a whole? (Sherr and Lozier, 1991)

The most common benchmarking in higher education takes the form of analyzing processes with peer institutions that are competing in similar markets. Educational benchmarking involves three major steps: 1) examining and understanding your own internal work procedures; 2) searching for “best practices” and 3) adopting “best practices” for continuous improvement.

The process of benchmarking in higher education presents educators with a specific set of challenges, numerous overall benefits and also criticism from some education circles (Epper, 1999).

The usefulness of business models in higher education has been limited by the fact that colleges and universities are, in many ways, different from businesses. Businesses have been drawn to benchmarking by competitive pressures. Higher education, heretofore, has not felt that pressure, but as the competitive landscape begins to change, more institutions will be forced to look for models of excellence through benchmarking. Benchmarking studies in higher education to date have focused on processes outside the classroom. Colleges do operate differently from businesses, but educating people is a process, just like making cars is a process (Nicklin, 1995). A critical challenge for higher education institutions is to learn how to effectively benchmark what business calls “core competencies”, or, in the case of higher education, processes directly related to teaching and learning (Epper, 1999). It has been found to be more difficult to reach consensus about criteria and the scope of a study with academics than with administrators. Institutions must go through a thorough self-analysis and have a clear understanding of their own processes in order to maximize the benefits of benchmarking. Also challenging for many institutions is that benchmarking can be costly (Alstete, 1995). Careful consideration must be given to the cost effectiveness of a benchmarking study. The greatest challenge to benchmarking is putting the results to good use after the study is completed. Institutions must not lose sight of the ultimate objective: to generate action, to change, and to improve.

Benchmarking studies have shown to be a model for action and not just data. The emphasis on best practices can give an institution a good sense of exactly how other organizations have improved their performance. The benchmarking process focuses on demonstrated best practices and therefore is able to distinguish between real innovation and simple reputation.

Benchmarking encourages “out of the box” thinking. Looking for best practices across industries and across sectors of higher education requires institutions to adopt a new level of openness and creativity (Epper, 1999). Examples of this type of comparison include Carnegie – Melon University comparing processes with the Kodak Corporation and Southwest Airlines learning from the pit crew of an Indianapolis 500 racecar team.

A lasting benefit to institutions involved in a benchmark study is the creation of new opportunities for collaboration, both internally and externally. Participants learn about internal processes in a more in-depth manner than previously known. Networking and collaborative opportunities with best practices organizations serve to raise the overall standards for involved constituencies.

The process of benchmarking is not without critics (Alstete, 1995). Benchmarking is said to be only capable of “marginally improving existing processes”. As previously mentioned, benchmarking is applicable mainly to administrative processes in higher education and becomes much more complex and difficult to use when dealing with instructional issues such as teaching and

learning outcomes. The harshest of critics dismiss benchmarking as merely a euphemism for copying what is perceived as successful in other institutions.

In light of the many challenges and benefits of benchmarking and in spite of the criticism, the process, according to Copa and Ammentorp (1998) can be "the driving force motivating a quest for quality and feasibility in new designs".

Examples of Benchmarking in Higher Education

Alstete (1995) divides the literature on benchmarking in higher education in three categories: 1) projects sponsored by national authorities; 2) consortium studies and 3) individual projects. The following discussion will present examples representative of the use of benchmarking in each of the above-mentioned categories.

Perhaps the most ambitious benchmarking project involving institutions of higher education ever undertaken was a study sponsored by NACUBO (National Association of College and University Business Officers) (Kempner, 1993). The study involved 150 colleges and over 1,600 individuals and developed over 600 benchmarks. Its goal was "to assist colleges and universities in measuring costs and service levels so that they will have the information necessary to begin a discussion of best practices with institutions that appear to achieve lower costs or higher service levels" (Kempner, 1993, p. 24). The NACUBO study placed an increased emphasis on processes, outputs and quality of services, instead of a

concentration on inputs and resources. Another national study, conducted in about the same time period, involved the American Assembly of Collegiate Schools of Business (AACSB). This pilot study provided participating colleges with a useful means of measuring internal operational effectiveness. As a consequence of their participation, the schools came to see benchmarking as a critical catalyst for change, largely because it “reduces or eliminates resistance to improvement because resistors find it difficult to dispute hard data” (Allstete, 1995, pp. 44-45).

In 1996, the Houston-based American Productivity and Quality Center (APQC) began facilitating benchmarking studies in higher education. APQC employed a form of benchmarking methodology called “consortium benchmarking”, wherein a group of higher education institutions that share a common interest in improving performance in a certain area, work side by side to identify best practices. A key feature of the methodology is that the sponsors do not just fund the study; they are also involved in shaping and carrying it out to learn something that they, as a group, want to improve (Epper, 1995). The groups can range in size from ten to fifty organizations, and typically include public, private, two-year, four-year, large, small, open-access and elite institutions.

One of the earliest examples of consortium benchmarking was the Study of Independent Education in Indiana in the mid-1970s (McGregor, 1998). Underwritten by the Lily Endowment and commissioned by the Independent

Colleges of Indiana, Inc., the project produced reports on institutional goals, the cost of instruction, student characteristics and finances, financial health, inter-institutional cooperation and economic impact. The finding provided the participating 32 institutions with an historical benchmark for planning and making projections.

Recently, individual institutions of higher education have, on their own, initiated benchmarking studies. In 1996, a study at East Tennessee State sought to "identify and verify key processes and measures that can help higher education administrators implement continuous improvement" (Stewart, 1996, p.1). Eight of ten key processes and 16 of 34 measures obtained an eighty percent or greater agreement response. Perhaps the most thorough individual benchmarking project, to date, is the one undertaken by Northwest Missouri State University (Seymour, 1996). The institution employed external comparisons, benchmarking, and the search for best practices throughout the seven categories used for scoring the Malcolm Baldridge National Quality Award: leadership; information and analysis; strategic and operational planning; human resources development and management; educational and business process management; institutional performance results; student focus and student and stakeholder satisfaction. Northwest Missouri State has even gone so far as to benchmark the benchmarking processing employed.

Benchmarking efforts, as reported in the literature, have occurred primarily in the four-year college sector. Although, for a long time the American

Association of Community Colleges has routinely collected and shared comparative data with its member institutions, true benchmarking is a rare phenomenon in two-year colleges (McGregor, 1998). Two examples are worthy of documentation in support of the study. Pima Community College, the fourth largest multi-campus community college in the United States instituted a benchmarking study to explore two topics: 1) Library services and 2) Faculty work load. A major impact of the study was the clarification of the definition of processes at the College. The most evident use of benchmarking at Pima was its role in deciding the future of new programs and the modifications of current ones (McGregor, 1998). The other significant study is a report intended for use by technical institutions planning to use benchmarking processes to facilitate change. This study, written by George Copa and William Ammentorp in 1998 contains five benchmarking studies that describe future-oriented practice for two-year technical colleges.

The growing use of benchmarking in higher education has led to the formation of CHEBA, The Consortium for Higher Education Benchmarking Analysis. The organization provides a forum for the exchange of performance measurements and benchmarking data for all levels of higher education around the world. Current membership in CHEBA numbers about 21 institutions, including Texas A&M University, University of Colorado and Occidental College (CHEBA.com, 2000).

To summarize the concept of benchmarking and its use in higher education, Spendolini (1992, p. 30), in his volume "The Benchmarking Book", states:

> Benchmarking may be particularly appealing to the academic community, due to its reliance on research methodology. This methodology is not unlike that practiced and taught by faculty and administrators in colleges and universities everywhere. Surveys, interviews, data collection, analysis, and reporting are all techniques with which most people in higher education are familiar.

Further clarification is provided by the following graphic depiction of what benchmarking is and isn't (Spendolini, 1992, p.33).

Table 1: Benchmarking

Benchmarking Is:	Benchmarking Isn't:
A continuous process	A one-time event
An investigation that provides valuable information	Provides simple answers
A process of learning from others	Copying, imitating
A time-consuming, labor intensive process	Quick and easy
A viable tool that provides information	A fad, buzzword

National Standards and Competencies in Music Technology

A thorough examination of the literature related to music technology's impact on the improvement of instruction in community college programs has produced no previous significant research. During the past decade, the

development of standards for technology use in the public schools (K-12) has been explored by MENC (Music Educators National Conference). A 1997 article "Technology Standards for College Music Degrees" by Deal and Taylor attempts to adapt the K-12 model for use in college and university music programs. Other than the aforementioned examples, there appears to be little consensus as to the content of music technology training and exactly how it should be incorporated into the music curriculum (Deal & Taylor, 1997).

In 1994, the National Committee for Standards in the Arts published "National Standards for Art Education", a volume with three main purposes: 1) to create a coherent vision for the arts 2) establish a foundation for curriculum and 3) assist in improvement of teaching and learning. By bringing together a cross section of organizations and individuals interested in the subject, the committee sought to reach a consensus regarding standards.

Researchers agree on the need for technology in music education. MENC states in the "Opportunity-to-Learn Standards for Music Technology" (MENC, 1999):

> It is essential that all schools provide a basic level of music technology equipment and software with the appropriate facilities for implementation. It is also essential that all schools provide a minimal level of training for their staff and teachers, and make an effort to effectively incorporate the technology into the music curriculum.

Taylor (Deal & Taylor, 1997, p.17), states "technology is an important tool – one that can be exceptionally powerful in teaching and learning. This tool is not an end in itself – it is a means to a much more important end: improved teaching

and learning." Both statements would elicit a broad-based agreement in music education circles, yet there is little consensus about the levels of use or a method of implementation in the curriculum.

There is an apparent need to establish consensus on the use of music technology at all levels of education. This study will attempt to establish standards for community college music programs by combining the current K-12 model with suggested college standards and specific results from a Delphi study. The result should produce a set of standards specific to community college use. The following discussion will outline current standards as found in the literature.

The Music Educators National Conference (MENC) lists as one of their primary goals the improvement of instruction in K-12 music programs. To that end, MENC and the National Committee on Standards in the Arts announced America's first voluntary Standards for Arts Education in January 1994. The standards were published as "National Standards for Arts Education". They represented a consensus of organizations and individuals representing many stakeholders in education. The project was supported by the United States Department of Education, the National Endowment for the Arts, and the National Endowment for the Humanities. The resultant publication "The School Music Program: A New Vision" (1994) was intended for those interested in quality music instruction and had three main purposes: 1) creating a coherent vision 2) building a comprehensive curriculum and 3) providing specific assistance to improve music education.

The publication identifies the need for developing a new music curriculum for the twenty-first century. There are several distinct differences between this approach and a traditional curriculum. Specific to this study is number six in a list of seven categories, dealing with technology:

> The curriculum should use current technology to individualize and expand music learning. Through the use of computers, electronic instruments, compact disc, CD-ROMS, and various MIDI devices, every student can be actively involved in creating, performing, listening, and analyzing music. Computers in particular can be used to facilitate the learning of basic skills and information. Teachers should work with students toward higher-level learning. Digital techniques make sound reproduction of the highest quality available in every classroom, while musical scores and resource materials also are quickly accessible. The technological limitations of the past have largely been erased. Advances in computer communications make possible the sharing of learning beyond school, state, and national boundaries. (MENC, 1994)

In addition to the above strong statements regarding technology standards in general, MENC lists nine general benchmarks for music instruction as follows:

1. Singing, alone and with others, a varied repertoire of music
2. Performing on instruments, alone and with others, a varied repertoire of music
3. Improvising melodies, harmonies and accompaniments
4. Composing and arranging within specified guidelines
5. Reading and notating music
6. Listening to, analyzing and describing music
7. Evaluating music and music performances
8. Understanding relationships between music, the other arts, and disciplines outside the arts
9. Understanding music in relation to history and culture

Rudolph (1997), in his article “Music Technology and the National Standards” suggests, in outline form, the following technology applications that can assist music educators in meeting the nine MENC standards:

1. Singing
    - Create, record, and playback accompaniments with MIDI keyboard and sequencing software
2. Improved singing technique with Claire and Audio Mirror software
    - Performing on instruments
    - Electronic keyboards
3. Improvising
    - Band-in-a-Box
4. Composing and arranging
    - Finale and Coda software
5. Reading and notating
    - Patterns in Pitch, Patterns in Rhythm software
6. Listening and Analyzing
    - Courseware Systems
7. Evaluating music
    - Pianist
8. Understanding relationships
    - Hypercard and Toolkit create discipline related projects

9. Music in history and culture

    - CD-ROM multi-media programs

Rudolph (1997) represents the thinking of a group of music educators that formed "Technology Institute for Music Educators (TI:ME). The organization is dedicated to the improvement of music education through the integration of technology in to the curriculum. In addition to tying technology to the MENC Nine Standards, TI:ME has identified seven areas of music technology that are directly applicable to music instruction in support of the National Standards for Art Education.

TI:ME lists the seven areas as competencies in Music Technology and the importance of each, (Rudolph, 1997, pp. 1-6):

1. Electronic musical instruments

    - Musical Instrument Digital Interface (MIDI)

2. MIDI sequencing

    - Use of computer program to store and retrieve musical information

3. Music notation software

    - Music notation software designed to print scores

4. Computer-Assisted instruction

5. Multi-media and digitized media

    - Integration of sound, text, graphics, pictures and videos in a digital format

6. Internet and telecommunications

7. Information processing, computer systems, and lab management

Further research into technology standards has yielded a document that serves as a 1999 addendum to the 1994 MENC National Standards (MENC, 1999). The Opportunity-To-Learn Standards for Music Technology Addendum does not actually call for resources beyond that seen as necessary in 1994, but rather speaks to the purchase of specific equipment and allocation of resources.

The previous discussion is meant to outline existing K-12 technology standards that have potential for adaptation to community college programs. The final section of the literature review will address technology standards related to post-secondary music programs.

The National Association of Schools of Music (NASM), organized in 1924, lists as an important objective "to provide a national forum for the discussion and consideration of concerns relevant to the preservation and advancement of standards in the field of music in higher education" (NASM, March 1999). In November 1999, NASM membership approved changes to NASM standards regarding undergraduate degrees in music. Among those changes, the following dealing with technology state:

Student must acquire

1. A basic overview understanding of how technology serves the field of music as a whole.

2. Working knowledge of the technological developments applicable to their area of specialization.

Furthermore, NASM issued a strong statement on music technology (NASM, December 1999):

> Music and technology have always shared a strong interdependence. As technology advances, the nature of this interdependence evolves constantly. Professional musicians need a baseline acquaintance with the ways in which technology is and will be used to accomplish various types of work in the discipline. Students need to understand enough about technology and its various applications to follow technical developments associated with music, and to have a fundamental basis for making evaluations about appropriate uses of the technology in various professional circumstances.

It is of interest to note that although NASM makes strong statements regarding the importance of technology in music instruction, they do not propose a specific curriculum in computers and music. Furthermore, the definition of competency is determined by the local institution, with NASM granting final approval during a site visit for membership.

In the course of the literature review, the article “Technology Standards for College Music Degrees” by Deal and Taylor, has provided the most comprehensive background on the subject matter as it relates to higher education. In an effort to outline standards for post-secondary applications for music technology, the authors proposed a model for technology standards in music degrees. The model is based on experience and two surveys, one from Florida public schools and one from electronic interviews with ten music departments across the country known for their use of technology.

The model is based on four central tenets:

- Technology in music degrees is a “bottom up” process. As students

- Develop greater skill and knowledge in technology, they put increasing pressure on faculty to incorporate technology in their instruction.

- NASM competency should be met by a coordinated series of experiences.

- The model should provide minimal competency standards achievable by all schools. They should also suggest advanced standards for schools that have a desire to excel.

- Because technology is constantly changing, the model should continue to evolve (Deal & Taylor, 1997, p.20).

Deal and Taylor proceed to outline the standards in the model in eleven steps, listing both minimal and preferred levels.

As previously stated, the purpose of the study is to identify standards of technology use in community college music programs. By combining those standards discovered in the literature pertaining to K-12 instruction with a proposed model for higher education, a list of possible standards specifically relevant to the community college will be formulated. These proposed standards will then become the focal point of an initial Delphi study. The purpose of the Delphi study is to reach consensus on a set of standards for community college use.

Summary and Conclusions

The impact of technology has changed the face of music education in community colleges over the past twenty years and has the potential to be a powerful force in the improvement of the teaching and learning process. A need

exists for standards to guide music educators as they deal with an array of decisions pertaining to the issues of funding, integration, suitability, and accountability. Although national standards have been set for public school music programs (K-12), little consideration has been given to similar standards for higher education, particularly the community college level.

Community college music educators face an unique set of circumstances. Students attending community colleges are often less prepared, less talented and poorly motivated. They come from a widely disparate background of musical preparation. Many community college music students pursue technical degrees and certificates with a goal of joining the workforce before obtaining a baccalaureate degree. Music educators are quickly realizing that technology can be a powerful tool to improve instruction and a set of standards outlining technology use would serve to strengthen music programs on a national level.

The establishment of a set of standards would fill a need yet to be addressed at the community college level. A synthesis of existing K-12 standards, models from higher education technology leaders, and a consensus of opinions from the proposed Delphi study could serve as a baseline for a new set of standards for community colleges.

CHAPTER III

Research Design

The nature of this study necessitates the use of a combination of qualitative and quantitative research procedure. According to Creswell (1994), characteristics of a qualitative research problem include: 1) an “immature” concept due to a conspicuous lack of theory and previous research and 2) a need to explore and describe the phenomena and to develop theory. The problem set forth in this study was matched to these characteristics and warranted further investigation.

Methodology

The Delphi technique was selected as the method to collect data. The Delphi technique was designed for technological forecasting of future events. Today, however, a review of the literature indicates that this technique is considered a reliable qualitative research method with potential for use in problem solving, decision-making and group consensus reaching in a wide variety of areas. Called “opinion technology” (Murray & Hammonds, 1995, p. 425), it is designed to use surveys to gain consensus on complex problems. It is a rapid, efficient, and systematic way to gather the opinions of a specific group of people. One of the advantages of the Delphi technique is that the respondents can be spread over a large geographical area.

The Delphi is characterized by three important features: 1) anonymous interaction and responses, 2) multiple iterations of rounds of questionnaires with researcher controlled group responses and feedback, and 3) presentation of statistical group responses. The Delphi technique, as a form of survey research is an accepted method of collecting data among social scientists and other fields that have not yet developed scientific laws. The method has been a popular consensus model in education, often as a problem-solving or decision-making tool for administrators. In higher education, the Delphi method has been used to 1) develop goals and objectives, 2) to improve curriculum, 3) to assist in strategic planning, and 4) to develop criteria (Linestone & Turoff, 1975).

Population and Sample Design

The choice of participants on the panel of "experts" was pivotal to the success of the study. The chief criterion for selection was the participants' level of expertise on the issues to be studied. Expertise implies that the individual panelists "have more knowledge about the subject matter than most people, or that they possess certain work experience, or are members in a relevant professional association" (Murray & Hammond, 1995, p. 428). Therefore, selection was based on the following criteria: 1) each panel member must currently be a member of the teaching faculty, or administration, at a community college employing technology in the music curriculum, 2) panel members must have access to e-mail and the Internet to facilitate correspondence, and 3) a

desire to assist in identifying and formulating standards for technology in community college music programs.

Procedure for Selection of Participants

A list of qualified participants was compiled by researching the Internet web site of the American Association of Community Colleges (www.aacc.nche.edu). Music programs were prescreened and only those offering a significant amount of technology in the curriculum were selected. To qualify for selection, music programs were required to offer courses in the curriculum that employed music technology hardware and software (i.e. MIDI, synthesis, recording technology, electronic music), in addition to the traditional offerings such as music theory, piano, ensembles and private lessons. An e-mail correspondence was sent to the database with an invitation to participate in the study (Appendix A).

The goal for participation on the panel was thirty-five music educators. The literature is mixed about the optimal size for a Delphi panel (Murray & Hammonds, 1995), some models suggest no upper limit, as long as a representative sample is selected; however, at a minimum, the final panel should be comprised of at least ten members. The goal of this study is within the participation limits of acceptability for a Delphi study of 10-50 (Linestone & Turoff, 1975).

Data Collection Procedure

To facilitate ease of response, all correspondence for the study was conducted by e-mail and Internet. An invitation to participate was sent as an e-mail with an attachment explaining the scope of the project. Individuals choosing to participate were requested to reply indicating their decision. Each member of the Delphi panel was then instructed to access the project web site (http://ftp.ccccd.edu/mcrawford/index.html) to respond to each iteration of the survey.

Round I

After the database of participants was established, the Round I questionnaire (Appendix C) was posted on the web site for consideration. The initial questionnaire consisted of a total of 57 items in six categories. Items included for evaluation were a synthesis of existing K-12 standards and models from existing higher education research. The panel was asked to evaluate each proposed standard by utilizing the Likert scale provided (5-strongly agree, 4-agree, 3-undecided, 2-disagree, 1-strongly disagree). Respondents were encouraged to offer comments at the end of each category.

A reminder e-mail (Appendix D) was sent to each non-respondent approximately one week following the initial contact. This procedure was repeated approximately two weeks later.

Round II

In the Round II questionnaire (Appendix F), panel members were requested to reconsider any standards that did not reach consensus during Round I. Consensus is defined as 75% agreement by panel members (Murray & Hammond, 1975). Respondents were provided with the following information in the Round II questionnaire:

- A list of standards that did not reach consensus
- Round I panel responses
- Individual responses

Each panelist was then given the option to reconsider their Round I response on a four point Likert scale that eliminated the undecided category. The goal of Round II was to re-evaluate non-consensus standards and either accept or reject them.

A reminder e-mail (Appendix G) was sent to each non-respondent one week after the Round II questionnaire.

Round III

The goal of Round III was to prioritize the final set of standards. Respondents were asked to consider each standard based on the following criteria:

Minimal: Meets minimum requirements to acquaint students with music technology

Desirable: Provides students with a set of music technology skills

Optimal: Prepares student for transfer to a university program or to enter the music industry workplace with a comprehensive understanding of music technology.

Analysis of Data

The Delphi panel generated information through three rounds of questionnaires. The “modified” version of the Delphi method; employing structured questions taken from existing K-12 standards, was used in Round I. Panelists were requested to rate the acceptability of each item as a standard for technology in community college music programs. A five-point Likert scale (5-strongly agree, 4-agree, 3-undecided, 2-disagree, 1-strongly disagree) was employed. The data were analyzed by an inspection of the means. Delphi is a process of reaching “consensus”. Items qualified for “consensus” if they are equal to or above the mean of responses. Following Round I, the data were analyzed and items that did not qualify as reaching consensus served as the basis for the Round II questionnaire. In the Round II survey panelists were asked to reconsider Round I responses on non-consensus items, in light of the entire panel results. The objective of this step was to make decisions on items originally indicated as “undecided” and move the panel toward consensus and stability. A four-point Likert scale (4-strongly agree, 3-agree, 2-disagree, 1-strongly disagree) was employed in this step, thus eliminating the “undecided” category.

The goal was to move all “undecided” responses from Round I to either “agree” or “disagree” in Round II.

After consensus and stability were reached in Round II, the final step involved ranking each standard in importance and relevance on a scale of 1) minimal 2) desirable 3) optimal.

The end result of the data collection produced a set of standards for technology use in community college music programs based on a thorough process generated from the collective background and experience of a panel of experts currently active in the field. In chapter five, the standards are presented in priority order based on minimal, desirable or optimal use.

CHAPTER IV

Findings and Analysis

The purpose of the study was to identify a set of standards for technology use to improve teaching and learning in community college music programs. Although limited research has been done on the use of technology to support music education K-12 and in four-year universities, little research on the problem in the community college was found. By combining existing K-12 standards, models from higher education technology leaders, and a consensus of opinions from community college music educators, this study seeks to establish a new set of standards specifically for community college use.

For the reasons given in the methods section, the Delphi technique was selected to collect data. By selecting community college music educators currently employing music technology to support the curriculum, the Delphi technique enabled the researcher to form a panel of experts to gain consensus.

Population of Participants

Selection of participants in the first survey was based on the following criteria: 1) each member must currently be a member of the teaching faculty, or administration, at a community college employing technology in the music

curriculum, 2) panel members must have access to e-mail and the Internet and 3) a desire to assist in the project. A list of 36 participants was compiled by accessing the website for the American Association of Community Colleges (www.aacc.nche.edu). Educators involved in technology-based curriculum including MIDI, synthesis, electronic music and recording technology, in addition to basic music education coursework, were included in a list of potential panel members. An e-mail correspondence with an attachment explaining the project was sent those identified with an invitation to participate. A reply was requested. A follow-up e-mail to educators who expressed a desire to participate contained instructions to access the project website and complete the Round I questionnaire. The original e-mail invitation was sent to community colleges in the following states: Arizona, California, Connecticut, Florida, Illinois, Kansas, Michigan, Missouri, Iowa, Oregon, Tennessee, Texas, Virginia, and Washington.

Twenty-two panel members responded to the Round I Questionnaire. Demographically, the initial panel represented 19 males, 3 females; all faculty members from 11 states including Arizona (1), California (3), Connecticut (1), Florida (1), Iowa (1), Kansas (1), Missouri (1), Oregon (2), Texas (6), Virginia (1), and Washington (4). Round II participants included 20 of the original 22 and Round III respondents numbered 14.

The table below displays the panel and their response pattern.

Table II: Panel Response Log

Panel	Member	College	St	Status	Round		
					1	2	3
1	Anderson	Foothill College	CA	F	X	X	X
2	Appert	Clark College	WA	F			
3	Baker	Grand Rapids C.C.	MI	F			
4	Bruya	Mt. Hood C.C.	OR	F	X		
5	Bissell	Del Mar C.C.	TX	F	X		
6	Blake	Los Angeles City College	CA	F			
7	Cazier	Columbia Basin College	WA	F	X	X	X
8	Coobatis	Miracosta College	CA	F			
9	Dismore	Cedar Valley C.C.	TX	F			
10	Garber	Tarrant County	TX	F	X	X	X
11	Gleason	Bellevue C.C.	WA	F	X	X	X
12	Gompertz	Pierce C.C.	CA	F			
13	Green	Scottsdale C.C.	AZ	F	X	X	X
14	Halversen	Spokane Falls C.C.	WA	F	X	X	X
15	Haynes	Jackson State C.C.	TN	F			
16	Hegarty	St. Louis C.C.	MO	F	X	X	X
17	Holt	North Harris C.C.	TX	F	X	X	
18	Hylton	Clackamas C.C.	OR	F	X	X	X
19	Keogh	Middlesex C.C.	CT	F	X	X	
20	McClure	Collin County C.C.	TX	F	X	X	X
21	Malott	Shoreline C.C.	WA	F			
22	Marshal	Broward C.C.	FL	F			
23	Mayfield	Kansas City C.C.	KS	F	X	X	X
24	Molloy	Southwestern C.C.	IA	F	X	X	X
25	McManus	Lane C.C.	OR	F			
26	Mitchell	De Anza C.C.	CA	F	X	X	
27	Moody	South Plains C.C.	TX	F	X	X	X
28	Morgan	Collin County C.C.	TX	F	X	X	X
29	Negri	J. Sargeant Reynolds	VA	F	X	X	
30	Page	McLennan C.C.	TX	F			
31	Prime	New World School	FL	F			
32	Reid	Shoreline C.C.	WA	F	X	X	
33	Rose	Miami-Dade C.C.	FL	F	X	X	
34	Schirmer	Parklane	IL	F			
35	Stitzel	Tarrant County	TX	F			
36	VanRegenmorter	American River C.C.	CA	F	X	X	X

Data Collection

The data collection consisted of three rounds of questionnaires sent to the Delphi panel. Each questionnaire built on the results of the previous survey with the objective being to generate a prioritized list of standards applicable to the community college context.

The Round I survey consisted of 57 questions divided into six categories: (Curriculum, Staffing, Classroom equipment, Materials/software, Facilities, Workforce competencies). In an effort to provide initial focus and direction, the modified Delphi format was employed, drawing Round I questions from a variety of sources including existing K-12 and four-year university standards. Questions included in the initial instrument were a combination of research, discussions, and ideas from public school organizations including Music Educators National Conference (MENC), and the National Committee for Standards in the Arts. In the area of higher education, a discussion of technology use in the Music Educators Journal; standards included in National Association of Schools of Music (NASM) publications; and areas of competencies proposed by the Technology Institute for Music Educators (TI:ME), all contributed to the formation of the initial set of 57 proposed standards.

The procedure for data collection in Round I required panel members to access the project website (http://ftp.ccccd.edu/mcrawford) and post their responses to the initial questionnaire. Panel members were asked to give their

name and e-mail address to insure accuracy in tallying the results. Confidentiality was maintained throughout the process. Each question was to be considered using a five point Likert scale (5-strongly agree, 4-agree, 3-undecided, 2-disagree, 1-strongly disagree). Panel members were instructed to respond from a perspective of establishing standards in an ideal community college music program. The questionnaire was designed to use the combined wisdom of the panel to set standards, not to survey current music technology practices in each respective school.

Of the 22 respondents to the Round I questionnaire, 19 submitted their answers on-line to the project web site. One panel member had erased the e-mail and requested additional information to complete the survey. Two panelists were unable to access the web site due to computer hardware limitations and requested hard copies of the initial survey. Copies were sent by mail, completed, and returned. Response time for the Round I questionnaire was approximately one month.

Round I

Round I panel responses were analyzed to determine the degree of consensus for each item by examining the mean score. Items with a mean score of 4.0 – 5.0 were considered to have reached consensus set at 75%. Round I consensus, as described in the Delphi method was actually set at 80%, 5%

above the acceptable range. Items with a mean score of 1.0 – 3.9 were considered to have not reached consensus.

Table II below shows the complete response pattern of the panel.

Table III: Round I Response

(Bold items indicate consensus)

Standards for Curriculum	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
A. Knowledge of computer basics	20	1		1	
B. Knowledge of computer-based instruction	12	8	1	1	
C. Knowledge of notation programs, sequencing programs, and MIDI	14	5	2	1	
D. Knowledge of fundamentals of multi-media	6	10	5	1	
E. Knowledge of internet access and use	13	8		1	
F. Knowledge of accompaniment systems	4	9	6	3	
2. Technology based music instruction builds on competencies established at the high school level.	4	9	2	7	
3. Use of technology is a regular and integral part of instruction.	9	13			
4. Learning profiles for students are maintained using electronic databases.	3	8	7	4	

Standards for Curriculum	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
5. Learning experiences in the curriculum include the use of computer-assisted instruction, MIDI sequencing, music notation software, Internet music resources and electronic musical instruments.	11	11			
6. Software and hardware selections are made based on the learning goals established for the students.	14	5	2	1	
7. Digital keyboards and various MIDI controllers are integrated into music performance ensembles.	6	7	4	4	1

Standards for Curriculum	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
8. Music classes have the same degree of access to technological resources as other classes in the school.	15	4	2	1	
9. Technology-based performance ensemble experiences using digital and MIDI instruments are available to students.	6	7	3	4	2
10. There is a minimum of one music elective course in which technology shapes a significant portion of the educational experience.	17	5			

Standards for Curriculum	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
12. Students use the Internet for music instruction.	5	9	6	2	
13. Distance-learning experiences are part of the curriculum.	1	7	8	3	3
14. Music schools should develop a five-year plan for technology curriculum and the acquisition and maintenance of hardware and software as well as work for a commitment from the college to fund the plan.	13	8	1		

Standards for Staffing	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. All music educators receive at least one staff development day per year dedicated to music technology.	9	7	2	2	2
2. A planned program of staff development to provide faculty with training in applying technology in the curriculum is in place.	10	4	4	2	2
3. Technical support is available.	13	5		4	
4. Teachers at this level have the training necessary to be able to teach and supervise music sequencing, notation and digital audio activities.	9	6	3	4	

Standards for Staffing	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
5. Music teachers have ready access to Internet-based professional development opportunities.	9	7	4	2	
6. In lab settings, an appropriate student/ teacher ratio is maintained through the use of teacher assistants or aides.	8	8	2	2	
7. Faculty at this level have experience with multi-media and web authoring.	4	6	6	5	1

Standards for Materials/Software	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. A library of instructional software that reinforces listening, analyzing, reading, and describing music.	11	9			1
2. Multimedia software that explores the relationship between music and the other arts.	4	16			
3. Multi-media software that enables students to create, improvise, compose, and perform music.	10	11			
4. Internet software for supervised access to web resources.	7	9	2	2	
5. Sequencing and notation software for recording, arranging, improvising and composing music with digital audio capability.	11	10			
6. Multi-media authoring software.	4	12	3	2	

Standards for Classroom Equipment	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. Every music classroom should contain one multi-media-ready computer that is internet capable and includes:					
A. Audio in/out capability	20	2			
B. MIDI sound generation	18	4			
C. Powered speakers	15	4	3		
D. CD or DVD-ROM player	19	2	1		
E. MIDI keyboard	17	4	1		
2. Students should have access to digital keyboards with standard size, touch responsive, piano keys.	15	5	1	1	

Standards for Classroom Equipment	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
3. Every music classroom should contain a large screen video display for class presentation.	11	8	2		
4. Each teacher has access to a computer for administrative purposes.	20	2			
5. Digital recording and CD-R capability are available.	15	6			
6. For instrumental instruction, alternative MIDI controllers, such as wind, guitar, string, and drum controllers are available.	3	8	3	4	4

Standards for Classroom Equipment	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
7. Music students who do not own a computer should be encouraged to purchase the following equipment:					
A. Desktop computer/monitor/CD-Rom	7	10	3	2	
B. Notebook computer/monitor/CD-Rom	2	5	9	6	
C. Advanced level sound card	6	6	7	3	
D. MIDI interface/keyboard	7	9	5	1	
E. Music software (Notation, MIDI sequencing, Digital Audio Mixing)	6	10	5	1	
F. CAI music software	2	6	10	3	

Standards for Facilities	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. Suitable space is available in each dedicated music classroom for one computer.	10	10	1		
2. Students have access to a general computer lab.	17	4			
3. Practice rooms contain appropriate computer music workstations.	4	8	2	5	2

Standards for Facilities	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
4. There is a separate dedicated classroom for a MIDI or digital keyboard lab with appropriate electrical and Internet capability.	14	6	1		
5. One room is dedicated to computer-based recording and composing.	14	4	2	1	

Standards for Workforce Competencies	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. Knowledge of both analog and digital technology.	11	9	1		
2. Sound recording involving competency with a wide variety of microphones.	7	12	2		
3. Digital audio editing skills (cut, copy, trim, mix) knowledge of DSP effects.	12	8	1		
4. Digital transfers to DAT or CD.	11	8			

Of the 57 items in the Round I questionnaire, 37 were accepted as standards by consensus of the panel. Twenty items scored 3.9 or below and did not reach consensus.

In the area of “standards for classroom equipment”, panelists are in agreement regarding equipment that should be present in each music classroom to support technology. However, when determining standards for student

equipment purchases, the panel was undecided on 4 of 6 items that addressed various components of a complete music technology system. Comments by panel members spoke to this disparity by indicating that community college music students often had limited funds and would only be able to purchase basic computer hardware and software. Therefore, the panel recommended that each student purchase a desktop computer with monitor, CD Rom, MIDI interface and keyboard as minimum equipment to support their studies.

It is of interest to note when analyzing the 20 non-consensus items that trends appear in the panel responses. In the category of “standards for staffing”, panelists placed 5 of 7 items below the 3.9 mean score. The ambiguity of response could point to the fact that technical support for music technology is not perceived as a priority. Although panelists indicate the need for technical support with faculty and staff development, there seems to be more pressing needs requiring attention when integrating music technology into the curriculum. Other areas of non-consensus included: 1) multi-media, 2) distance learning, and 3) Internet. Panelists indicated that these advanced concepts were non-essential and should not be considered as standards.

Round II

The goal of the Round II questionnaire was to reevaluate the 20 standards that did not reach panel consensus in Round I. An explanatory e-mail outlining the format is shown in Appendix E. Panel members indicated they were undecided

when evaluating certain standards. In an effort to encourage respondents to move to either “agree” or “disagree” in Round II, a four-point Likert scale was employed (4-strongly agree, 3-agree, 2-disagree, 1-strongly disagree). Each respondent was shown a Round I summary of non-consensus standards, reminded how they had responded, and asked to reconsider their initial response with the new four-point scale. To clarify the instructions, a color-coding system was used:

First Line: Green – Round I Panel summary

Second Line: Blue – Initial response

Third Line: Red – New response

Table IV below indicates the Round II panel response.

Table IV: Round II Response

Standards for Curriculum	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. The following computer skills are essential to all music students:					
D. Knowledge of fundamentals of multi-media	6	10	5	1	0
New Answer	6	11		2	
F. Knowledge of accompaniment systems	4	9	6	3	0
New Answer	4	12		3	
2. Technology based music instruction builds on competencies established at the high school level.	4	9	2	7	0
New Answer	6	8		5	

Standards for Curriculum	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
4. Learning profiles for students are maintained using electronic databases.	3	8	7	4	0
New Answer		11		7	
7. Digital keyboards and various MIDI controllers are integrated into music performance ensembles.	6	7	4	4	1
New Answer	4	11		3	1
Standards for Curriculum	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
9. Technology-based performance ensemble experiences using digital and MIDI instruments are available to students.	6	7	3	4	2
New Answer	5	8		3	3
12. Students use the Internet for music instruction.	5	9	6	2	0
New Answer	5	14		1	
13. Distance-learning experiences are part of the curriculum.	1	7	8	3	3
New Answer		14		5	1

Standards for Staffing	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. All music educators receive at least one staff development day per year dedicated to music technology.	9	7	2	2	2
New Answer	9	8		1	1

Standards for Staffing	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
2. A planned program of staff development to provide faculty with training in applying technology in the curriculum is in place.	10	4	4	2	2
New Answer	11	5		2	1
4. Teachers at this level have the training necessary to be able to teach and supervise music sequencing, notation and digital audio activities.	9	6	3	4	0
New Answer	9	6		3	
6. In lab settings, an appropriate student/teacher ratio is maintained through the use of teacher assistants or aides.	8	8	2	2	0
New Answer	9	5		1	1
7. Faculty at this level have experience with multi-media and web authoring.	4	6	6	5	1
New Answer	5	9		5	

Standards for Classroom Equipment	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
6. For instrumental instruction, alternative MIDI controllers, such as wind, guitar, string, and drum controllers are available.	3	8	3	4	4
New Answer	2	11		4	3

Standards for Classroom Equipment	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
7. Music students who do not own a computer should be encouraged to purchase the following equipment:					
B. Notebook computer/monitor/CD-Rom	2	5	9	6	0
New Answer		12		6	
C. Advanced level sound card	6	6	7	3	0
New Answer	2	9		6	
E. Music software (Notation, MIDI sequencing, Digital Audio Mixing)	6	10	5	1	0
New Answer	5	10		3	
F. CAI music software	2	6	10	3	0
New Answer	2	11		5	

Standards for Materials/Software	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
6. Multi-media authoring software.	4	12	2	2	0
New Answer	3	13		3	

Standards for Facilities	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
3. Practice rooms contain appropriate computer music workstations.	4	8	2	5	2
New Answer	4	12		3	1

Round II was analyzed by examining the new responses on the four-point Likert scale. Standards scoring 3.0-4.0 or 75% or more were accepted and added to the original list of 37 items. Seven standards scored 2.8 or below and

were dropped from the set of standards. If panelists failed to respond to certain standards, no numeric values were assigned and they were not included in the computation of means.

As was previously stated, consensus is defined as a minimum of 75% agreement on any particular item at the second round or later. Stability or convergence occurs when there is little or no further shifting of panel responses from round to round. The criterion of stability was established as a shift of 20% or less after successive rounds. After two rounds, seven of the original 57 standards were not accepted by the panel. Analysis indicated a shift of 11%, well below the 20% criterion for stability. The standards deleted after Round II include:

Curriculum

4. Learning profiles for students are maintained using electronic databases

9. Technology-based performance ensemble experiences using digital and MIDI instruments are available to students

13. Distance learning experiences are part of the curriculum

Classroom Equipment

1. For instrumental instruction, alternative MIDI controllers, such as wind, guitar, string and drum controllers are available.

7b. Notebook computer/monitor/CD Rom

7c. Advanced sound level card

7f. CAI music software

Of the original 22 panelists, 20 members responded to the Round II questionnaire. Response time for Round II was 23 days. When analyzing Round

II responses, it was interesting to note that the five items under “standards for staffing” that did not reach consensus in Round I, were subsequently included after Round II. This change could have been the result of additional thought and closer scrutiny. Panelists could have been influenced by viewing the panel response in total and using that information to form their new response.

Consistent with Round I response concerning student-purchased equipment, the panel further refined the category by including the item concerning music software purchase, but did not accept; 1) notebook computer, 2) advanced level sound card, and 3) CAI software. Panel members possibly were cognizant of their students' limited financial resources and felt a need to recommend purchase of necessary hardware and software only.

In the category of “Standards for Curriculum”, the concept of distance learning as part of the curriculum was rejected by the panel. Distance learning is relatively new to community college music programs and curriculum is in the exploratory stages. Panel response to the item indicated that distance learning was not a high priority as a curriculum consideration at this time.

Round III

The third and final questionnaire contained the final 50 standards established by consensus of the Delphi Panel. The purpose of Round III was to prioritize each standard in order of importance for community college music

programs. Panel members were asked to consider each standard based on a three point Likert scale with the following criteria:

Minimal: Meets minimum requirements to acquaint students with music technology

Desirable: Provides students with a set of music technology skills

Optimal: Prepares students with a comprehensive understanding of music technology.

Panel members were also asked to respond based on the assumption of adequate funding and availability of faculty.

Responses were analyzed by computing overall patterns and trends among the entire set of 50 standards and also results within each of six sub-categories of standards (curriculum, staffing, equipment, materials/software, facilities, and workplace competencies). Fourteen panel members continued with the study and completed the study by completing the Round III questionnaire.

Panel members identified 41 of 50, or 82%, of standards as minimal, defined as meeting minimum requirement to acquaint students with music technology. To qualify as minimal, it was determined that a standard must receive a response representing 50% or higher of the 14 member panel (7-14). Standards identified as minimal represented 82% of the total number of standards.

Table V: Round III Panel Response

(Bold items indicate minimum standards)

Standards for Curriculum	Minimal	Desirable	Optimal
1. The following computer skills are essential to all music students:			
A. Knowledge of computer basics	11	1	2
B. Knowledge of computer-based instruction	8	4	2
C. Knowledge of notation programs, sequencing programs, and MIDI	7	7	
D. Knowledge of fundamentals of multi-media	2	10	2
E. Knowledge of internet access and use	10	2	2
F. Knowledge of accompaniment systems		11	3
2. Technology based music instruction builds on competencies established at the high school level.	3	8	3
3. Use of technology is a regular and integral part of instruction.	7	5	2
4. Learning experiences in the curriculum include the use of computer-assisted instruction, MIDI sequencing, music notation software, Internet music resources and electronic musical instruments.	10	3	1
5. Software and hardware selections are made based on the learning goals established for the students.	10	2	2
6. Digital keyboards and various MIDI controllers are integrated into music performance ensembles.	1	9	4
7. Music classes have the same degree of access to technological resources as other classes in the school.	10	1	3
8. There is a minimum of one music elective course in which technology shapes a significant portion of the educational experience.	8	2	4
9. The school offers a specialized course in which students utilize appropriate music technologies in composing and arranging, recording, and producing multi-media.	9	5	
10. Students use the Internet for music instruction.	5	5	4

Standards for Curriculum	Minimal	Desirable	Optimal
11. Music schools should develop a five-year plan for technology curriculum and the acquisition and maintenance of hardware and software as well as work for a commitment from the college to fund the plan.	10	3	1

Standards for Staffing	Minimal	Desirable	Optimal
1. All music educators receive at least one staff development day per year dedicated to music technology.	7	6	1
2. A planned program of staff development to provide faculty with training in applying technology in the curriculum is in place	8	3	3
3. Technical support is available.	9	3	2
4. Teachers at this level have the training necessary to be able to teach and supervise music sequencing, notation and digital audio activities.	8	4	2
5. Music teachers have ready access to Internet-based professional development opportunities.	8	3	3
6. In lab settings, an appropriate student/teacher ratio is maintained through the use of teacher assistants or aides.	8	5	1
7. Faculty at this level have experience with multi-media and web authoring.	5	6	3

Standards for Classroom Equipment	Minimal	Desirable	Optimal
1. Every music classroom should contain one multi-media-ready computer that is internet capable and includes:			
A. Audio in/out capability	11	1	2
B. MIDI sound generation	9	3	2
C. Powered speakers	10	1	3
D. CD or DVD-ROM player	11	1	2
E. MIDI keyboard	9	3	2

Standards for Classroom Equipment	Minimal	Desirable	Optimal
2. Students should have access to digital keyboards with standard size, touch responsive piano keys.	9	3	2
3. Every music classroom should contain a large screen video display for class presentation.	9	2	3
4. Each teacher has access to a computer for administrative purposes.	11	1	2
5. Digital recording and CD-R capability are available.	11	1	2
6. Music students who do not own a computer should be encouraged to purchase the following			
A. Desktop computer/monitor/CD-Rom	8	3	3
B. MIDI interface/keyboard	6	4	4
C. Music software (Notation, MIDI sequencing, Digital Audio Mixing)	7	3	4

Standards for Materials/Software	Minimal	Desirable	Optimal
1. A library of instructional software that reinforces listening, analyzing, reading, and describing music.	9	3	2
2. Multimedia software that explores the relationship between music and the other arts.	6	7	1
3. Multi-media software that enables students to create, improvise, compose, and perform music.	10	3	1
4. Internet software for supervised access to web resources.	7	5	2
5. Sequencing and notation software for recording, arranging, improvising and composing music with digital audio capability.	10	3	1
6. Multi-media authoring software.	7	7	

Standards for Facilities	Minimal	Desirable	Optimal
1. Suitable space is available in each dedicated music classroom for one computer.	8	4	2
2. Students have access to a general computer lab.	12		2
3. Practice rooms contain appropriate computer music workstations.	4	7	3
4. There is a separate dedicated classroom for a MIDI or digital keyboard lab with appropriate electrical and Internet capability.	11	1	2
5. One room is dedicated to computer-based recording and composing.	10	4	

Standards for Workforce Competencies	Minimal	Desirable	Optimal
1. Knowledge of both analog and digital technology	7	5	2
2. Sound recording involving competency with a wide variety of microphones	8	6	
3. Digital audio editing skills (cut, copy, trim, mix) knowledge of DSP effects	8	6	
4. Digital transfers to DAT or CD	8	6	

Six of the 50 standards were identified as desirable, defined as providing students with a set of technology skills. To qualify as desirable, it was determined that a standard must also receive a response representing 50% or higher of the 14 member panel (7-14). Standards identified as desirable represented 12% of the total number of standards.

Table VI: Desirable Standards

Standards for Curriculum	Minimal	Desirable	Optimal
D. Knowledge of fundamentals of multi-media	2	10	2
F. Knowledge of accompaniment systems		11	3
2. Technology based music instruction builds on competencies established at the high school level.	3	8	3
6. Digital keyboards and various MIDI controllers are integrated into music performance ensembles.	1	9	4

Standards for Material/Software	Minimal	Desirable	Optimal
2. Multi-media software that explores the relationship between music and other arts.	6	7	1

Standards for Facilities	Minimal	Desirable	Optimal
3. Practice rooms contain appropriate computer workstations.	4	7	3

None of the 50 standards received 50% or larger agreement as optimal. The remaining three standards were identified as falling into a category of non-agreement based on the divergent response of the panel. None of these standards received 50% agreement and represented 6% of the total set of standards.

Table VII: Non-Agreement Standards

Standards for Curriculum	Minimal	Desirable	Optimal
10. Students use the internet for music instruction.	5	5	4

Standards for Equipment	Minimal	Desirable	Optimal
6 B. MIDI interface/keyboard	6	4	4

Standards for Staffing	Minimal	Desirable	Optimal
7. Faculty at this level has experience with multi-media and web authoring.	5	6	3

Category Analysis

Standards For Curriculum

It becomes apparent in the analysis of the Round III curriculum category that the panel believes in a need for a strong set of minimal standards for programs seeking to acquaint students with music technology. Students must be firmly grounded in basic concepts of technology in order to succeed. Eleven of 16 standards in the category were identified as minimal, supporting the belief that the use of technology is a regular and integral part of instruction and can be utilized as a powerful tool to improve teaching and learning in music programs. Panel endorsement of 69% in the category as minimal requirements suggests that music educators need to implement music technology across the curriculum

and not just as supplemental material. Students should know the basics of music technology as they relate to general music education. Educators seeking to implement a successful program of music technology should base the curriculum on these suggested curriculum standards. In general, the panel indicated a need to expose community college music students to the following fundamental technology concepts:

- Knowledge of computer basics
- Knowledge of the Internet
- Varied learning experiences (CAI, MIDI)
- Software/Hardware selections based on specific goals
- Access to technological resources
- Specialized courses in multi-media
- Need for a five-year plan for music curriculum

Specific comments by individual panel members, added at the end of the "curriculum" category, serve to support and underscore the need for a set of minimum curriculum standards:

> "Music technology should interact with all areas of specialization, to varying degrees, be curriculum based and integrated in the larger vision."
>
> "Care should be taken to ensure that the technology assist the creative process, rather than replaces it."
>
> "Musicians can learn without the technology, but the music education is greatly enhanced when the aspiring musician is able to harness the power of this technology."

Panelists agreed that music programs should develop a five-year plan for music technology curriculum and the acquisition and maintenance of hardware and software. The following comments supports a need to accelerate the plan to compensate for the ever-changing nature of computer equipment:

> "The idea of a five-year plan is not realistic in the case of digital or computer technology. Specific plans this far out are likely to miss the mark significantly."

> "Curricular plans should be developed for two-years intervals."

Panel members identified four standards as desirable in the curriculum category. Desirable standards were defined as those providing students with a set of music technology skills. Standards in the desirable range were not seen as vital to a basic program, but would add value to the curriculum as it expands and matures. Rationale for the placement of standards in the desirable range could reflect a panel concern for a need for additional financial support, additional technical assistance and limited curriculum space, in order to implement.

Each of the four standards identified as desirable presented unique limitations.

1.D – "Knowledge of fundamentals of multi-media" was considered desirable by 71% of the panel. Multi-media is a higher-order complex technology skill and is generally not approached in the curriculum until students have an elemental knowledge of technology concepts. The panel indicates that this standard would add value, but should be considered only in established programs. I.F "Knowledge of accompaniment systems" received 79% panel agreement as

desirable. Accompaniment systems are included in only a small segment of most community college music curriculum and do not warrant minimal designation. 2 – "Technology-based music instruction builds on competencies established at the high school level" received 57% agreement by the panel. It would appear difficult to designate this standard as minimal given the unique demographic of community college students. Music students attending community colleges are diverse in age, experience and background. It would be difficult to assess the level of competency established in high school by the diverse population, let alone build on it in a community college curriculum. 6 – "Digital keyboards and various MIDI controllers are integrated into music performance ensembles" received 64% agreement as desirable. Most performance ensembles at the community college level employ traditional instruments. The use of digital keyboards and MIDI controllers require considerable budget support and advanced music skills to successfully perform with an ensemble. The standard pertains to skills employed in advanced programs.

One standard in the curriculum category, pertaining to the use of the Internet for music instruction, resulted in a divergent panel response with no agreement. The Internet is till an immature concept educationally. Music educators are uncertain about the viability of the medium as an educational tool and distance learning, in general is un-tested in community college music

programs. For these possible reasons, the panel seemed unable to reach agreement in categorizing this standard.

Standards For Staffing

Panel responses and comments in the staffing category indicate a strong need to establish a planned program of faculty and staff development. Panel comments emphasized this need:

> "Faculty, especially adjunct faculty, need training and inspiration."
>
> "One staff development day per year is not nearly enough to keep up with technological changes."

The importance of faculty development and training takes on an added importance considering music technology has only been employed in community colleges for less than 20 years and is primarily taught by a faculty that was not formally schooled in these concepts. The problem is exacerbated by a full-time to part-time facility ratio that puts the responsibility of teaching music technology on adjunct instructors who are often the least prepared in pedagogy. The panel agrees that the standards for staffing are pivotal in providing a minimum program of music technology.

Six of the seven standards, or 86%, in the staffing category were identified as minimal standards. Of these 6 standards, 3. – Technical support is available; received the highest percentage of agreement at 64%, (9 of 14).

It is important to note the panel felt strongly that technical support was a key factor in the successful implementation of music technology in the

curriculum. The equipment-intense nature of music technology makes qualified technical support staff a necessity.

Only one standard failed to reach agreement at the 50% level in the staffing category: 7. – "Faculty at this level have experience with multi-media and web-authoring." Most community college music faculty, trained in a traditional music education curriculum, do not have the pedagogical background in multi-media and web authoring. It would seem difficult to require standards at any level to a professoriate that may not be prepared to teach the concepts. The panel seems to have considered this reasoning in the ambivalence of their response.

Standards For Equipment

The panel achieved the highest level of agreement in the category for equipment. Eleven of 12 standards, or 92%, were identified as minimal. Basic equipment, provided in every music classroom, should include the following:

- Multi-media computer (internet capable)
- Audio in/out capability
- MIDI sound generation
- Powered speakers
- CD or DVD-ROM player
- MIDI keyboard

One panelist comment supports the importance of access to equipment:

> "Access to technology is key and classroom technology that allows students to get "hands on" and visual interaction is crucial to the learning process."

Panelists were willing to encourage students to purchase their own equipment but were careful when stipulating exact requirements, in light of financial considerations. Panel comments underscore the debate:

> "I cannot comfortably tell someone to spend over one thousand dollars just because it seems like a good idea to me…I don't know their financial situation."

> "Students in community colleges usually cannot afford their own equipment."

> "In an urban community, it is not really economically wise to encourage students to spend a lot of money on equipment for themselves – they will just go in debt and that will stand in the way of their ability to stay in school."

It is obvious from the comments that community college educators are cognizant of the financial concerns of their students and do not want to overburden them with unnecessary equipment costs. The panel felt strongly that the school should provide necessary equipment to support the program.

In the discussion of student-purchased computers, the panel did not reach agreement to recommend the purchase of a MIDI interface/keyboard. The divergent response on the standards could also have been caused by financial concerns.

Standards for Materials/Software

Support through purchase of adequate materials/software was identified as a vital component of any music technology program. Minimal standards for software include:

1. A comprehensive library of instructional software
2. Multi-media software
3. Internet software
4. Sequencing and notation software
5. Multi-media authoring software

It is interesting to note that although the panel was hesitant to recommend many elements of multi-media as minimal standards; they do, in this case, feel these concepts should be supported by adequate materials and software. 2. – "Multi-media software that explores the relationship between music and the other arts" was placed in the desirable category.

Standards For Facilities

In the analysis of the category on facilities, 4 of 5, or 80%, of standards were found to be at the minimal level. Student access to dedicated classrooms and labs was thought to be a key factor in the category. It was deemed important that classrooms be dedicated to a single function of technology to accommodate specific applications. Taking this concept one step further, one respondent notes:

> "A computer-based recording studio differs greatly from a computer-based composing studio. Students can benefit greatly from a composing studio (regular sound monitors, access to an isolation booth) instead of always having to work in a lab."

In the discussion of 3. – "Practice rooms contain appropriate computer work stations", the panel found that workstations would be desirable, but cost and supervision problems could be limiting factors in designating the standard as minimal.

Proper facilities to house music technology classes at the community college level can be problematical. Most programs will have limited space and, at best, the traditional configuration of large ensemble room, classrooms and practice rooms is the norm. Educators seeking to add to existing facilities will need to make a strong case to administrators of the viability of music technology across the music curriculum and be willing to start small and expand to new facilities as the program grows.

Standards For Workforce Competencies

Heretofore, the discussions of standards have pertained to the use of music technology in the general music curriculum. In the category of workplace competencies, the emphasis shifts from general education to programs with technology that specifically are designed to train students to enter the workplace after completing a two-year terminal degree. It is assumed that students involved in such programs would have an extensive background in music technology.

Although all four standards were designated as minimal, the panel responded significantly in the desirable range also. The response is consistent with the reasoning that students in the area of the curriculum will be expected to go above and beyond minimal standards if they hope to succeed in the workplace.

CHAPTER V

Summary and Conclusions

The purpose of the study was to identify standards for technology use to improve teaching and learning in community college music programs. It was discovered through a thorough search of the literature, that although music technology standards exist for K-12 music technology use, there has been little research on the subject, as it pertains to higher education; specifically community college. It was determined that a study of current best practices in music technology could be beneficial to establishing standards for the community college music department. A modified Delphi study was employed to analyze current technology standards and reach consensus on standards for community college educators. The key stakeholders chosen as the panel of experts were 36 community college music educators involved in music technology. The research found that the Delphi technique is a useful tool for obtaining a consensus of opinion among professionals spread over a wide geographical area without bringing them together. The original 36 panel members represented 14 states, and 35 community colleges.

The Round I questionnaire, listing 57 suggested standards in six categories, resulted in panel consensus of 37 standards with the remaining 20 standards determined as undecided. Criteria for consensus were an examination

of the mean (4.0 – 5.0 – accepted, 1.0 – 3.9 – undecided, on a five-point Likert scale).

The purpose of the Round II questionnaire was to further define and focus the panel opinion of the 20 undecided standards from Round I. The format of the Round II questionnaire was altered to a four-point Likert scale, asking panelists to reconsider their previous undecided response in light of the overall panel response. Panelists were given the option to change their response or retain their initial indication. Of the 20 standards to be reconsidered, 13 reached consensus and seven were rejected. At this point, a total of 50 standards had reached consensus, and it was determined that the Delphi panel had reached stability after two rounds.

The goal of the final questionnaire was to prioritize the 50 standards as minimal, desirable, or optimal on a three-point Likert scale. It is significant to observe that 41 of 50 (82%) standards were indicated as minimal. Of the remaining nine standards, six received 50% agreement as desirable, and only three were determined to have obtained no agreement.

Summary of Findings

A thorough analysis of the Delphi panel response to the study resulted in the following list of findings:

- Community college music educators, planning to successfully utilize music technology to improve teaching and learning, should implement the 41 standards determined as minimal by the Delphi panel.
- In the area of curriculum, music technology must be fully integrated into the entire program. Knowledge of computer basics and Internet access are essential. Curriculum planning, preferably in at least three years cycles, is critical to the successful implementation of music technology.
- In the area of staffing, a planned program of staff development must be in place. Technical support is essential.
- In the area of classroom equipment, each classroom must contain one multi-media-ready computer. Students are encouraged to purchase music technology equipment, but only within the parameters of sound fiscal practices.
- In the area of materials/software, it is important that each program furnish a basic minimum that allows student access to appropriate items. It was not deemed essential that music programs provide access to more complex multi-media authoring software, Internet software or software that explores the relationship between music and related arts.

- In the area of facilities, access to dedicated, technologically equipped, classrooms, labs and practice rooms is a necessity.

Conclusions

The use of technology to enhance teaching and learning has become an essential part of a comprehensive curriculum in community college music programs. The concept is best summarized in the following quote from a member of the Delphi panel:

> Musicians can learn without the technology, but the music education is greatly enhanced when the aspiring musician is able to harness the power of this technology.

Standards suggested by the panel of experts can become valuable tools for educators. The following conclusions are warranted:

- Standards can allow educators an opportunity to view “best practices” in community college music programs on a national level. Standards identified in the study are specific to the community college level, taking into account the unique challenges inherent in these programs.
- Music technology, for the improvement of teaching and learning, is most effective when included across the entire music curriculum. The study has considered and identified minimum standards in all aspects of a program that should include: curriculum, staffing, equipment, materials/software, facilities and workforce competencies.

- Music educators can utilize standards as rationale to substantiate requests for additional facilities, staffing, equipment and general support for music programs. Stakeholders, armed with knowledge of national standards, may become more supportive of community college music program requirements.
- For music programs introducing music technology for the first time, a set of minimum standards serve as a framework on which to build a quality program. Likewise, programs currently involved in music technology can use standards indicated as desirable or optimal as guidelines for their programs as they grow and mature.
- Standards, unique to community college level programs, allow faculty and administrators an opportunity to monitor student progress. A consistent process of student assessment against the set of standards can enhance student success.
- By utilizing a set of standards, music faculty can become more effective and efficient in implementing technology into the curriculum. By observing and following accepted practices in successful programs, faculty don't feel the need to "reinvent the wheel", but could depend on standards pertinent to their level of higher education.

Suggestions for Further Study

Further research needs to be done. Educational technology is rapidly changing and the implications for higher education present a challenge to faculty and administrators. Music technology, a relative newcomer to higher education, offers an opportunity to expand and enhance the curriculum in community college music programs and, in so doing, better prepare students for the future. To adequately meet this goal, community college music educators must continue to explore the educational ramifications of music technology and further refine the use of technology as it relates to the improvement of teaching and learning.

Standards suggested in this study will be useful only as long as current technology is viable. Music educators must monitor the field of music technology as it changes and attempt to adjust the scope of technology use accordingly.

The study sought to portray a cross-section of technology use in community college music programs. A much larger sample could uncover valuable information that could add to the study. As the use of music technology grows in our community college music programs, the standards used to define the success of these programs will expand and mature through further research.

APPENDICES

APPENDIX A

INTRODUCTORY E-MAIL WITH ATTACHMENT

Dear Community College Music Educator:

Please access the attachment to this e-mail and consider lending your assistance to the project. Your involvement would require completing three 15-minute questionnaires over the next two months to assess "Technology Standards for the Improvement of Teaching and Learning in Community College Music Programs." I appreciate the value of your expertise. Please reply.

Michael Crawford
Dean of Fine Arts
mcrawford@ccccd.edu
972-881-5807

The integration of technology in the music curriculum has important implications for community college educators. Technology to support and improve the quality of teaching and learning is pivotal in preparing our students. It is therefore important to assess the use of technology by benchmarking "best practices" in an effort to establish a set of standards for community college music programs.

You are asked to participate in a panel of 35 community college music educators involved with technology to improve teaching and learning at their respective institutions. I would greatly appreciate your assistance on this project because I believe your background and knowledge in the field will be of great value in the research, As a doctoral candidate in the Higher Education program at the University of North Texas, I would be interested in your input as it relates to my dissertation: "Technology Standards for the Improvement of Teaching and Learning in Community College Music Programs."

In order to save your valuable time, all survey information and data collection will be conducted on-line via e-mail and the Internet. An initial questionnaire will be posted on my website for your response. Two additional rounds will be conducted to reach consensus from the panel of "experts." I anticipate the length of the project to be approximately two months (October to December 2000.)

Please be assured that your responses will be held in complete confidence. There are no known risks involved in this study. Your participation is strictly voluntary and you may withdraw at any time without penalty or prejudice. When the study is complete, the results will be available upon request.

For questions regarding this study contact Dr. Ron Newsom, Faculty Advisor, at the University of North Texas (940-565-2045) or the UNT Institutional Review Board 940-565-3940.

I believe that it is important to establish standards for technology in community college music programs and I thank you, in advance, for your willingness to participate.

Please reply by e-mail to (mcrawford@ccccd.edu) if you wish to join the panel. Instructions to access the initial questionnaire will follow within one week.

Sincerely,

Michael Crawford
Dean of Fine Arts
Collin County Community College
972-881-5807

APPROVED BY THE UNT IRB, 10/17/00

APPENDIX B

ACKNOWLEDGEMENT E-MAIL

Dear Community College Music Educator:

Thank you for your reply and willingness to lend your expertise, as we assess "Technology Standards for the Improvement of Teaching and Learning in Community College Music Programs."

The Round 1 questionnaire has now been posted on the project website (http://ftp.ccccd.edu/mcrawford). Please take the opportunity to post your response within the next week. Feel free to edit or comment at the end of each section.

I will compile the responses to Round 1 and send them to you via e-mail. In Round 2 you will have an opportunity to further refine the standards discussed in an effort to reach group consensus.

Again, thanks, for sharing your views on Music Technology and I look forward to your response.

Michael Crawford
Dean of Fine Arts
mcrawford@ccccd.edu
972-881-5807

APPENDIX C

ROUND I QUESTIONNAIRE

QUESTIONNAIRE

TECHNOLOGY STANDARDS FOR COMMUNITY COLLEGE MUSIC PROGRAMS

(Using the scale at the right of the page, please respond to each item. Feel free to list additional statements at the end of each section.)

First Name: _____ Last Name: _____

Email address: _____

Standards for Curriculum	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. The following computer skills are essential to all music students:					
A. Knowledge of computer basics	○	○	○	○	○
B. Knowledge of computer-based instruction	○	○	○	○	○
C. Knowledge of notation programs, sequencing programs, and MIDI	○	○	○	○	○
D. Knowledge of multi-media fundamentals	○	○	○	○	○
E. Knowledge of internet access and use	○	○	○	○	○
F. Knowledge of accompaniment systems	○	○	○	○	○
2. Technology based music instruction builds on competencies established at the high school level	○	○	○	○	○
3. Use of technology is a regular and integral part of instruction.	○	○	○	○	○
4. Learning profiles for students	○	○	○	○	○

are maintained using electronic databases.					
5. Learning experiences in the curriculum include the use of computer-assisted instruction, MIDI sequencing, music notation software, Internet music resources and electronic musical instruments.	○	○	○	○	○
6. Software and hardware selections are made based on the learning goals established for the students.	○	○	○	○	○
7. Digital keyboards and various MIDI controllers are integrated into music performance ensembles	○	○	○	○	○
8. Music classes have the same degree of access to technological resources as other classes in the school.	○	○	○	○	○
9. Technology-based performance ensemble experiences using digital and MIDI instruments are available to students.	○	○	○	○	○
10. There is a minimum of one music elective course in which technology shapes a significant portion of the educational experience	○	○	○	○	○
11. The school offers a specialized course in which students utilize appropriate music technologies in composing and arranging, recording, and producing multi-media	○	○	○	○	○
12. Students use the Internet for music instruction.	○	○	○	○	○
13. Distance-learning experiences are part of the curriculum	○	○	○	○	○

14. Music schools should develop a five-year plan for technology curriculum and the acquisition and maintenance of hardware and software as well as work for a commitment from the college to fund the plan.	○	○	○	○	○
Other...					
Standards for Staffing	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. All music educators receive at least one staff development day per year dedicated to music technology.	○	○	○	○	○
2. A planned program of staff development to provide faculty with training in applying technology in the curriculum is in place.	○	○	○	○	○
3. Technical support is available.	○	○	○	○	○
4. Teachers at this level have the training necessary to be able to teach and supervise music sequencing, notation and digital audio activities.	○	○	○	○	○
5. Music teachers have ready access to Internet-based professional development opportunities.	○	○	○	○	○
6. In lab settings, an appropriate student/teacher ratio is maintained through the use of teacher assistants or aides.	○	○	○	○	○
7. Faculty at this level have experience with multi-media and web authoring.	○	○	○	○	○

Other...

Standards for Classroom Equipment	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. Every music classroom should contain one multi-media-ready computer that is internet capable and includes:					
A. Audio in/out capability	○	○	○	○	○
B. MIDI sound generation	○	○	○	○	○
C. Powered speakers	○	○	○	○	○
D. CD or DVD-ROM player	○	○	○	○	○
E. MIDI keyboard	○	○	○	○	○
2. Students should have access to digital keyboards with standard size, touch responsive piano keys.	○	○	○	○	○
3. Every music classroom should contain a large screen video display for class presentation.	○	○	○	○	○
4. Each teacher has access to a computer for administrative purposes.	○	○	○	○	○
5. Digital recording and CD-R capability are available	○	○	○	○	○
6. For instrumental instruction, alternative MIDI controllers, such as wind, guitar, string, and drum controllers are available	○	○	○	○	○
7. Music students who do not own a computer should be encouraged to purchase the following equipment:					
A. Desktop computer/monitor/CD Rom	○	○	○	○	○

B. Notebook computer/monitor/CD-Rom	○	○	○	○	○
C. Advanced level sound card	○	○	○	○	○
D. MIDI interface/keyboard	○	○	○	○	○
E. Music software (Notation, MIDI sequencing, Digital Audio Mixing)	○	○	○	○	○
F. CAI music software	○	○	○	○	○
Other...					
Standards for Materials/Software	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. A library of instructional software that reinforces listening, analyzing, reading, and describing music.	○	○	○	○	○
2. Multimedia software that explores the relationship between music and the other arts.	○	○	○	○	○
3. Multi-media software that enables students to create, improvise, compose, and perform music.	○	○	○	○	○
4. Internet software for supervised access to web resources.	○	○	○	○	○
5. Sequencing and notation software for recording, arranging, improvising and composing music with digital audio capability.	○	○	○	○	○
6. Multi-media authoring software	○	○	○	○	○
Other...					
Standards for Facilities	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. Suitable space is available in each dedicated music classroom for one computer.	○	○	○	○	○

2. Students have access to a general computer lab	○	○	○	○	○
3. Practice rooms contain appropriate computer music workstations	○	○	○	○	○
4. There is a separate dedicated classroom for a MIDI or digital keyboard lab with appropriate electrical and Internet capability.	○	○	○	○	○
5. One room is dedicated to computer-based recording and composing.	○	○	○	○	○
Other...					

Standards for Workforce Competencies	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. Knowledge of both analog and digital technology	○	○	○	○	○
2. Sound recording involving competency with a wide variety of microphones	○	○	○	○	○
3. Digital audio editing skills (cut, copy, trim, mix) knowledge of DSP effects	○	○	○	○	○
4. Digital transfers to DAT or CD	○	○	○	○	○
Other...					

Thank you for filling out the questionnaire. Please hit the Submit button to send in your responses.

Submit Query	**Reset**

APPENDIX D

ROUND I - E-MAIL REMINDER

Dear Music Educator:

Response to the Round 1 questionnaire to assess “Technology Standards for the Improvement of Teaching and Learning in Community College Music Programs” has been excellent. If you have not had the opportunity to complete the questionnaire and submit your results, please do so at your earliest convenience. If you are having technical problems accessing the website (http://ftp.ccccd.edu/mcrawford), please feel free to call me at 972-881-5807 so we can choose an alternate method to record your response.

Again, I appreciate your time and effort on this project and look forward to your thoughts and ideas.

Michael Crawford
Dean of Fine Arts
mcrawford@ccccd.edu
972-881-5807

APPENDIX E

ROUND II - EXPLANATORY E-MAIL

Dear Panel Member:

Thank you for your response to the Round 1 questionnaire for "Technology Standards for the Improvement of Teaching and Learning in Community College Music Programs." Your input is appreciated and I look forward to your responses in Round 2 as the panel moves towards consensus. Upon completion of round 2, the entire set of standards will quickly follow for your final consideration in Round 3.

As you access the website to complete the Round 2 questionnaire, please follow the instructions listed below:

1) The Round 1 questionnaire contained 57 suggested standards for your consideration. The panel reached consensus (defined as 75% of the respondents placing an item above a mean of 4.0) on 37 of the standards. The remaining 20 standards fell in the 3.0-3.9 mean range, indicating that the panel had not reached consensus. The goal of round 2 is to reevaluate these 20 standards.

2) Your responses should reflect standards considered as "best practices" national, not necessarily those currently in place at your institution.

I appreciate your time and effort. Please access the website http://ftp.ccccd.edu/mcrawford and post your responses at your earliest convenience.

Michael Crawford
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APPENDIX F

ROUND II – QUESTIONNAIRE

QUESTIONAIRE - Round 2

TECHNOLOGY STANDARDS FOR COMMUNITY COLLEGE MUSIC PROGRAMS

Using the scale at the right of the page, please respond to each item after comparing your answer to the averaged results of all respondents.

Please confirm you name and email address.

First Name: _____ Last Name: _____

Email address: _____

Standards for Curriculum	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
D. Knowledge of fundamentals of multi-media	6	10	5	1	0
Your Answer					
New Answer	6	11		2	
F. Knowledge of accompaniment systems	4	9	6	3	0
Your Answer					
New Answer	4	12		3	
2. Technology based music instruction builds on competencies established at the high school level.	4	9	2	7	0
Your Answer					
New Answer	6	8		5	
4. Learning profiles for students are maintained using electronic databases.	3	8	7	4	0
Your Answer					
New Answer		11		7	

Standards for Curriculum	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
7. Digital keyboards and various MIDI controllers are integrated into music performance ensembles.	6	7	4	4	1
Your Answer					
New Answer	4	11		3	1
9. Technology-based performance ensemble experiences using digital and MIDI instruments are available to students.	6	7	3	4	2
Your Answer					
New Answer	5	8		3	3
12. Students use the Internet for music instruction.	5	9	6	2	0
Your Answer					
New Answer	5	14		1	
13. Distance-learning experiences are part of the curriculum.	1	7	8	3	3
Your Answer					
New Answer		14		5	1

Standards for Staffing	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. All music educators receive at least one staff development day per year dedicated to music technology.	9	7	2	2	2
Your Answer					
New Answer	9	8		1	1
2. A planned program of staff development to provide faculty with training in applying technology in the curriculum is in place.	10	4	4	2	2
Your Answer					
New Answer	11	5		2	1

Standards for Staffing	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
4. Teachers at this level have the training necessary to be able to teach and supervise music sequencing, notation and digital audio activities.	9	6	3	4	0
Your Answer					
New Answer	9	6		3	
6. In lab settings, an appropriate student/teacher ratio is maintained through the use of teacher assistants or aides.	8	8	2	2	0
Your Answer					
New Answer	9	5		1	1
7. Faculty at this level have experience with multi-media and web authoring.	4	6	6	5	1
Your Answer					
New Answer	5	9		5	

Standards for Classroom Equipment	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
6. For instrumental instruction, alternative MIDI controllers, such as wind, guitar, string, and drum controllers are available.	3	8	3	4	4
Your Answer					
New Answer	2	11		4	3
7. Music students who do not own a computer should be encouraged to purchase the following equipment:					
B. Notebook computer/monitor/CD-Rom	2	5	9	6	0
Your Answer					
New Answer		12		6	

C. Advanced level sound card	6	6	7	3	0
Your Answer					
New Answer	2	9		6	
Standards for Classroom Equipment	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
E. Music software (Notation, MIDI sequencing, Digital Audio Mixing)	6	10	5	1	0
Your Answer					
New Answer	5	10		3	
F. CAI music software	2	6	10	3	0
Your Answer					
New Answer	2	11		5	

Standards for Materials/Software	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
6. Multi-media authoring software.	4	12	2	2	0
Your Answer					
New Answer	3	13		3	
Standards for Facilities	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
3. Practice rooms contain appropriate computer music workstations.	4	8	2	5	2
Your Answer					
New Answer	4	12		3	1

Thank you for filling out the questionnaire. Please hit the Submit button to send in your responses.

Submit Query	**Reset**

APPENDIX G

ROUND II - E-MAIL REMINDER

Dear Panel Member:

Last Friday, February 2, 2001, I sent a request to complete the Round 2 questionnaire of the Music Technology Survey. If you have not had a chance to submit your responses, please do so at your earliest convenience, so we can proceed to the final round and completion of the project. If you are having difficulty accessing the website, please call me at 972-881-5807 so we can facilitate your reply.

Again, I appreciate your time and effort. Please access the website http://ftp.ccccd.edu/mcrawford and post your response.

Michael Crawford
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mcrawford@ccccd.edu
972-881-5807

APPENDIX H

ROUND III - EXPLANATORY E-MAIL

Dear Music Technology Panel:

We have arrived at the Third and final round of the survey to determine "Technology Standards for the Improvement of Teaching and Learning in Community College Music Programs." I certainly appreciate all of our input and I look forward to sharing the results of the study upon completion.

The Round 3 questionnaire consists of a set of 50 standards (from the original 57) included by a consensus of the panel. In your final determination, I would like you to place each standard in one of three categories as defined:

Minimal:	meets minimum requirements to acquaint students with music technology.
Desirable:	provides students with a set of music technology skills.
Optimal:	prepares students for transfer to a university program or to enter the music industry workplace with a comprehensive understanding of music technology.

At this stage, I am most interested in your rationale for placement and would encourage any comments that might clarify your position. Please respond based on the assumption of adequate funding and availability of faculty.

Please access the website http://ftp.ccccd.edu/mcrawford and post your final responses and comments.

I sincerely thank you for all of your time, energy and patience on this project.

Michael Crawford
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APPENDIX I

ROUND III - QUESTIONNAIRE

QUESTIONNAIRE – Round 3

TECHNOLOGY STANDARDS FOR COMMUNITY COLLEGE MUSIC PROGRAMS

Using the scale at the right of the page, please respond to each item. Feel free to list additional statements at the end of each section However, please do not use carriage returns in the comments boxes as they interfere with later processing of the form results. Thank you.

First Name: _____ Last Name: _____

Email address: _____

Standards for Curriculum	Minimal	Desirable	Optimal
1. The following computer skills are essential to all music students:			
A. Knowledge of computer basics	11	1	2
B. Knowledge of computer-based instruction	8	4	2
C. Knowledge of notation programs, sequencing programs, and MIDI	7	7	
D. Knowledge of fundamentals of multi-media	2	10	2
E. Knowledge of internet access and use	10	2	2
F. Knowledge of accompaniment systems		11	3
2. Technology based music instruction builds on competencies established at the high school level.	3	8	3
3. Use of technology is a regular and integral part of instruction.	7	5	2
4. Learning experiences in the curriculum include the use of computer-assisted instruction, MIDI sequencing, music notation software, Internet music resources and electronic musical instruments.	10	3	1
5. Software and hardware selections are made based on the learning goals established for the students.	10	2	2
6. Digital keyboards and various MIDI controllers are integrated into music performance ensembles.	1	9	4
7. Music classes have the same degree of access to technological resources as other classes in the school.	10	1	3
8. There is a minimum of one music elective course in which technology shapes a significant portion of the educational experience.	8	2	4
9. The school offers a specialized course in which students utilize appropriate music technologies in composing and arranging, recording, and producing	9	5	

multi-media.			
10. Students use the Internet for music instruction.	5	5	4

Standards for Curriculum	Minimal	Desirable	Optimal
11. Music schools should develop a five-year plan for technology curriculum and the acquisition and maintenance of hardware and software as well as work for a commitment from the college to fund the plan.	10	3	1

APPENDIX J

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